SUPPORTING FRAME FOR A UTILITY VEHICLE

FIELD OF THE INVENTION

The present invention relates to a supporting frame for a utility vehicle, e.g., a tractor unit, having a front part, a center part and a rear part.

BACKGROUND INFORMATION

German Published Patent Application No. 43 22 716 describes a supporting frame for utility vehicles which is composed of three different sections, namely, a front part for fitting the front axle region, a center part, and a rear part for fitting the rear axle. The front part and the rear part are each composed of longitudinal member segments connected to cross members, the longitudinal member segments being designed as aluminum castings with numerous ribs. The center part has a box-shaped cross section, the two side walls of the center part assuming a supporting function and being composed of extruded aluminum profiles. Provision is made for the three different sections to be preassembled as modules, and for all the components which are to be fastened to the supporting frame to be arranged on the corresponding sectional frame before the sectional frame is connected. The longitudinal member segments in the front part and rear part have an H section.

German Published Patent Application No. 101 48 312 describes a supporting frame for a chassis of a utility vehicle, this supporting frame having a box-shaped cross-section over its entire length. The supporting frame is composed of two top chords, two bottom chords and thrust plates connecting the chords to one another. The bottom chords may be of three-piece design, so that each bottom chord has a front piece, a center piece and a rear piece. The drive train and if need be further components may be installed in the interior space of the box-shaped supporting frame.

A further supporting frame for utility vehicles with a box-shaped cross-section over its entire length is described in German Published Patent Application No. 197 50 981.

A supporting frame for a utility vehicle is described in German Published Patent Application No. 101 37 379, this supporting frame having a box-shaped cross-section and being composed of in each case two top chords and two bottom chords and vertical webs connecting the top chords and bottom chords to one another. The two top chords and the two bottom chords are likewise connected by webs. The webs are arranged such that a reinforcing frame closed all round is obtained.

SUMMARY

An example embodiment of the present invention may provide a supporting frame for utility vehicles which, compared with conventional supporting frames, may provide more space for accommodating functional elements, for example, exhaust gas cleaning systems and fuel tanks.

To this end, according to an example embodiment of the present invention, a supporting frame for a utility vehicle, e.g., a tractor unit, having a front part, a center part and a rear part, may be provided in which the center part is of latticework-like construction with at least two top chords and two bottom chords and forms a box-shaped cross-section as viewed in the longitudinal direction of the vehicle, and in which the front part and the rear part are of ladder-frame-like arrangement with a right-hand and a left-hand longitudinal member, the longitudinal members having a U-like cross-section as viewed in the longitudinal direction of the vehicle.

Compared with conventional supporting frames, the latticework-like arrangement of the center part of box-shaped cross-section may result in more space for accommodating, for

example, exhaust gas cleaning systems and fuel tanks. As a result, due to the supporting frame hereof, future exhaust gas regulations for utility vehicles may be fulfilled without reducing the fuel tank volume. On the other hand, the front part and the rear part may be constructed in a proven manner with longitudinal members of U-like cross-section, so that proven engine, rear-axle and front-axle fastenings may be used.

In the front and rear part, the legs of the longitudinal members of U-like cross-section in each case may extend in the direction of the opposite longitudinal members, and the top chords and/or bottom chords lying at the longitudinal edges of the center part may have an L-like cross-section as viewed in the longitudinal direction of the vehicle.

Since the top chords and/or bottom chords in the center part have an L-like cross-section, as much space as possible may be provided inside the box-shaped cross-section of the center part for the installation of functional elements.

A first leg of the top chords and/or bottom chords of L-like cross-section may extend parallel to a base of the respectively associated longitudinal member of the front part and/or rear part, and a second leg of the top chords and/or bottom chords may extend outwardly from the base of the respectively associated longitudinal member in the opposite direction to the legs of the longitudinal members.

Due to such an arrangement, the space inside the box-shaped cross-section of the center part may be utilized more effectively. Nonetheless, a robust supporting frame may be ensured.

A substantially triangular thrust plate for connecting the top chord, the bottom chord and the respectively associated longitudinal member of one side may be provided.

For example, a triangular thrust plate having a central aperture may be selected, so that a robust connection of top chord, bottom chord and longitudinal member may be possible on the one hand and material and weight may be saved on the other hand.

The top chords and bottom chords of one side, the two opposite top chords and/or the two opposite bottom chords may in each case be connected to one another by thrust plates.

The selection of thrust plates may provide as large a useful space as possible to be provided inside the center part of box-shaped cross-section. For example, thrust plates of a lightweight type of construction may be selected in order to keep down the overall weight of the supporting frame.

The bottom chords, at least in the region of the rear end of the center part, may be connected to one another by a portal member which is U-like as viewed in the longitudinal direction of the vehicle and is open downward.

By such a portal member, a robust connection of the two bottom chords may be provided on the one hand and the space for the spring deflection and rebound movements of a cardan shaft may be provided on the other hand.

The portal member, in its top region opposite the bottom chords, may be connected to a cross member of the front part or rear part.

In this manner, a connection to the front part or rear part may be achieved which may be simple in terms of design and may at the same time be robust.

A chassis fastening for the rear axle, e.g., a stabilizer mount, may be arranged in the region of the rear end of the bottom chords of the center part.

The arrangement of a chassis fastening in the region of the rear end of the bottom chords of the center part may provide that the rear end of the bottom chords is located essentially at axle level. Compared with conventional supporting frames, in which complicated struts have to be provided in order to provide an articulation point at axle level, construction cost and weight may therefore be saved. Specifically in the case of a stabilizer mount in which, according to an example embodiment of the present invention, only one mounting stirrup may have to be fastened to the rear end of the bottom chords, a considerable weight saving may be obtained compared with a conventional arrangement in which a robust member may have to extend from the longitudinal member down to approximately axle level.

Further features and aspects of example embodiments of the present invention are described in more detail below with reference to the appended Figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective exploded view of a supporting frame according to an example embodiment of the present invention.

Fig. 2 illustrates the supporting frame illustrated in Fig. 1 in an assembled state.

Fig. 3 illustrates a supporting frame according to an example embodiment of the present invention and provided with functional elements, in an exploded view.

DETAILED DESCRIPTION

The supporting frame 10 illustrated in Fig. 1, for a utility vehicle, may be used, for example, for a tractor unit. As

viewed in a forward travel direction 12, the supporting frame 10 has a front part 14, a center part 16 and a rear part 18.

The front part 14 may be constructed in a conventional manner and, as viewed in the forward travel direction 12, has a right-hand longitudinal member segment 20, a left-hand longitudinal member segment 22 and a cross member 24 connecting the two longitudinal member sections 20, 22. The two longitudinal member segments 20, 22 are each arranged in the shape of a U profile with a base and two legs starting from the base and extending in the same direction. The U-profile-shaped longitudinal member segments 20, 22 are arranged such that the legs of the longitudinal member segments 20, 22, starting from the base, each extend in the direction of the opposite longitudinal member segment 20, 22.

The rear part 18 may be arranged in a conventional manner of a right-hand longitudinal member segment 26, as viewed in the forward travel direction 12, a left-hand longitudinal member segment 28 and two cross members 30, 32. Like the front part 14, this also gives the rear part 18 a ladder-frame-like construction. The longitudinal member segments 26, 28 of the rear part 18 are arranged in the shape of a U profile and are oriented relative to one another in the same manner as the longitudinal members segments 20, 22 of the front part 14.

As viewed in the forward travel direction 12, the center part 16 has a right-hand top chord 34, a left-hand top chord 36, a right-hand bottom chord 38 and a left-hand bottom chord 40. The top chords 34, 36 and the bottom chords 38, 40 each have an L-shaped cross-section as viewed in the longitudinal direction of the vehicle and are each bent transversely to the longitudinal direction of the vehicle in order to be able to be adapted to the different frame widths of the front part 14 and of the rear part 18.

In their center region, the two top chords 34, 36 are connected to one another by a thrust plate 42 in a lightweight type of construction. In the same manner, the right-hand top chord 34 and the right-hand bottom chord 38 are connected to one another by a further thrust plate 44 in a lightweight type of construction, and the left-hand top chord 36 and the left-hand bottom chord 40 are connected to one another by a further thrust plate 46 in a lightweight type of construction. The thrust plates 42, 44 and 46 result in reinforcement in the center region of the center part 16, this reinforcement extending around three sides of the box-shaped center part 16. However, the center part 16 remains open toward the underside. As a result, for example, sufficient space may be available for the spring deflection and rebound movements of a cardan shaft.

In the front region of the center part 16, the right-hand bottom chord 38 and the left-hand bottom chord 40 are connected to one another by a cross member 48. At the level of the cross member 48, the right-hand bottom chord 38 and the right-hand top chord 34 are connected to one another by a rear leg of a triangular thrust plate 50, and in the same manner, on the opposite side of the center part 16, the left-hand top chord 36 and the left-hand bottom chord 40 are connected by a leg of a further triangular thrust plate 52. The triangular thrust plates 50 are arranged at the front end of the center part 16 such that a further leg in each case extends parallel to the right-hand top chord 34 and the left-hand top chord 36, respectively, and constitutes their extension beyond their respective front end. The two legs of the triangular thrust plates 50, 52 are arranged at a right angle to one another, and a connecting strut of the triangular thrust plates 50, 52 extends at an angle of about 45° to the two legs and connects their ends. The construction of the triangular thrust plates 50, 52 with two legs and a connecting strut is produced by the provision of a triangular central aperture in the thrust plate 50, 52. The center part 16 is connected to the front part 14

by the two top chords 34 and the top legs of the triangular thrust plates 50, 52 being overlapped with and connected to the base of the respectively associated longitudinal member segments 20, 22.

At the rear end of the center part 16, the right-hand top chord 34 and the right-hand bottom chord 38 are connected to one another by a triangular thrust plate 54 which is of identical construction to the thrust plates 50, 52 already explained. The left-hand top chord 36 and the left-hand bottom chord 40 are also connected to one another in the region of the rear end of the center part 16 by a further triangular thrust plate 56 which is likewise of identical construction to the thrust plates 50, 52 already explained.

The arrangement of the rear triangular thrust plates 54, 56 is selected to be the same as the arrangement of the front thrust plates 50, 52, so that, at the two rear thrust plates 54, 56, the connecting strut arranged at an angle to the top chords 34, 36 and the bottom chords 38, 40 also faces the front in each case with respect to the forward travel direction 12.

In addition, in the region of the rear end of the center part 16, the two bottom chords 38, 40 are connected to one another by a U-shaped portal member 58. The provision of the portal member 58 firstly creates a robust connection of the rear ends of the bottom chords 38, 40 and at the same time provides sufficient space for the spring deflection and rebound movements of the cardan shaft. As illustrated in Fig. 2, the top section of the portal member 58 is connected to the cross member 30 of the rear part 18 in the assembled state.

In addition, in the region of the rear ends of the bottom chords 38, 40, in each case a stabilizer mount 60 is provided on the outer side of the bottom chords 38, 40. The stabilizer mounts 60 are each of stirrup-shaped arrangement, the

intention being for a respective stabilizer link for the rear axle to be accommodated in the stirrup.

As illustrated in Figs. 1 and 2, the individual components of the supporting frame are riveted or screwed to one another. To this end, numerous through-holes are provided in the individual components.

Fig. 2, which is a perspective view of the assembled supporting frame 10 illustrated in Fig. 1, it is illustrated that the right-hand top chord 34 and the right-hand longitudinal member segment 20 of the front part 14 overlap one another and are fastened to one another in the region of this overlapping. Together with the connection of the triangular thrust plate 50 to the right-hand top chord 34, the right-hand longitudinal member segment 20 and the front end of the right-hand bottom chord 38, an extremely robust connection of the center part 16 to the front part 14 may be obtained. The opposite connection of the left-hand top chord 36 to the left-hand longitudinal member segment 22 of the front part 14 may be provided in an analogous manner.

In the region of the connection between the center part 16 and the rear part 18, the right-hand top chord 34 and the right-hand longitudinal member segment 26 of the rear part 18 overlap one another and are fastened, for example, riveted, screwed, etc., to one another in the region of this overlapping. The top leg of the triangular thrust plate 54 essentially completely covers the region of the overlapping between the right-hand top chord 34 and the right-hand longitudinal member segment 26 and is connected, for example, riveted, screwed, etc., to the top chord 34 and the right-hand longitudinal member segment 26 of the rear part 18 in the region of the overlapping. Together with the connection of triangular thrust plate 54 to the rear end of the right-hand bottom chord 38, an extremely robust connection of the center part 16 to the rear part 18 may be obtained as a result. On

the opposite side, the left-hand top chord 36, the left-hand longitudinal member segment 28 of the rear part 18 and the rear end of the left-hand bottom chord 40 are connected to one another in the same manner by the triangular thrust plate 56.

The schematic, perspective view of Fig. 3 illustrates the supporting frame 10 according to an example embodiment of the present invention in an exploded illustration, some functional elements already being installed in the front part 14 and the rear part 18. As becomes clear from the illustration in Fig. 3, the front part 14, the center part 16 and the rear part 18 may thereby be preassembled as modules and may then be put together in the preassembled state to form the supporting frame 10. As a result, the production times may be markedly reduced and the accessibility during the fitting of the individual functional elements may be improved.

Specifically, according to the illustration in Fig. 3, a drive unit 62 with transmission 64 is installed in the front part 14. Furthermore, a front axle, for example, may be attached to the front part 14, and only then would the latter, with attached front axle, be put together with the center part 16 and the rear part 18.

In the illustration in Fig. 3, a rear axle 66 is already attached to the rear part 18. Two stabilizer links 68 may readily be seen, which on the one hand are connected to the rear axle 66 and on the other hand are inserted into the stabilizer mount 60. The stabilizer links 68 extend essentially at the level of the center of the rear axle 66, and consequently the stabilizer mounts 60 are also arranged approximately at the level of the center of the rear axle 66. As illustrated in Figs. 1 to 3, the stabilizer mounts 60 may be arranged as compact stirrup-shaped mounting points. Compared with conventional arrangements of such stabilizer mounts, this may provide a considerable saving of material and weight, since, in conventional supporting frames, the mounting

points likewise have to be arranged approximately at the level of the center of the rear axle 66, and consequently the stabilizer mount requires a member which extends from the right-hand or left-hand longitudinal member beyond the level of the center of the rear axle.

Example embodiments of the present invention may provide a supporting frame for a utility vehicle which, compared with conventional supporting frames, may provide more space in the region of the center part 16 for accommodating an exhaust gas cleaning system and a fuel tank. Nonetheless, proven unit fastenings may be used in the region of the front part 14 and the rear part 18, since, in the region of the front part 14 and the rear part 18, the supporting frame 10 hereof may be adapted in the ladder-frame-like type of construction, with right-hand longitudinal member segments 20, 26, left-hand longitudinal member segments 22, 28 and cross members 24, 30, 32 connecting the longitudinal member segments.